

DOCUMENT RESUME

ED 219 111

JC 820 366

AUTHOR Kester, Donald L.
TITLE Is Micro-Computer Assisted Basics Skills Instruction Good for Black, Disadvantaged Community College Students from Watts and Similar Communities? A Preliminary, Fall Semester 1981-82 Mini Audit Report Suggests Caution.

PUB DATE Aug 82
NOTE 14p.; Paper presented at the International School Psychology Colloquium (Stockholm, Sweden, August 1-6, 1982).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Persistence; *Achievement Gains; Black Students; Community Colleges; Comparative Analysis; *Computer Assisted Instruction; *Conventional Instruction; *Cost Effectiveness; Costs; *Educationally Disadvantaged; Reading Improvement; Remedial Instruction; *Remedial Reading; Two Year Colleges; Two Year College Students

IDENTIFIERS *Los Angeles Southwest College CA

ABSTRACT

This report assesses the economic viability of micro-computer assisted basic skills instruction at Los Angeles Southwest College, an institution in which 96% of the students are from minority groups, the majority are from low-income families, and most have low levels of academic achievement (averaging a seventh-grade level in reading skills). After presenting a demographic profile of the college's student population, an outline of students' basic skills needs, and the sources of funding for computer-assisted basic skills instruction, the report examines the relative costs of computer-assisted and regular faculty instruction in basic skills. The conclusion is reached that, over a 5-year period, significant savings could be made through the use of computer-assisted instruction. The remainder of the report consists of an independent auditor's assessment of whether students who used computer-assisted instruction to supplement their regular programs made greater gains in reading skills and had lower termination rates than those students who did not have supplementary instruction. The report indicates that there was a significantly greater improvement in the reading skills of the four classes that used computer-assisted instruction than of the two classes that did not, but that the computer-assisted group suffered higher rates of attrition than the control group. The report concludes with a recommendation to investigate whether certain types of students benefit more from computer-assisted instruction than others. (HB)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

IS MICRO-COMPUTER ASSISTED BASICS SKILLS
INSTRUCTION GOOD FOR BLACK, DISADVANTAGED
COMMUNITY COLLEGE STUDENTS FROM WATTS
AND SIMILAR COMMUNITIES?:

A Preliminary, Fall Semester 1981-82
Mini Audit Report Suggests Caution

by

Donald L. Kester, Ph.D.
Consultant, Educational Program
Evaluation, Audit, and Research
Office of the Los Angeles County
Superintendent of Schools
Downey, California 90242

This paper was presented by Dr. Kester at the International
School Psychology Colloquium held at the University of Stockholm,
Stockholm, Sweden on August 1 - 6, 1982.

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

D. L. Kester

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ✓ This document has been reproduced as
received from the person or organization
originating it.
- Minor changes have been made to improve
reproduction quality.
- Points of view or opinions stated in this docu-
ment do not necessarily represent official NIE
position or policy.

ACKNOWLEDGEMENTS

A number of special people deserve to be thanked.

At Los Angeles Southwest College:

A number of people have assisted in the development, funding, housing, and managing of the micro-computer-assisted basic skills instructional program that began operation in the fall semester of 1981-82 at Los Angeles Southwest College. Without the yeoman's efforts of these people, it is sure that this innovative program would not have been obtained and pilot tested:

Dr. Mary Borell, Coordinator of Institutional Research at Los Angeles Southwest College, was the grants person who successfully coordinated the writing of the SDIP grant proposal entitled, "From Watts to Work: The Implementation of a Computer Assisted Basic Skills Program at Southwest College."

Ruby Wallace, Instructor in Southwest's Developmental Communications Program, coordinated the pre and post-testing and generally monitored the progress of the micro-computer assisted experiment.

Alex Slabo, Director of Southwest's Learning Center, was responsible for housing the micro-computers and coordinating the day-to-day physical operation of the laboratory.

Dr. Art Cherdack, Dean of Instruction at Southwest, provided needed administrative support at the Los Angeles County Office.

At Office of the Los Angeles County Superintendent of Schools:

Cindy Ismael, Auditing Statistician with the Office of the Los Angeles County Superintendent of Schools, provided statistical analyses and made a number of good suggestions.

IS MICRO-COMPUTER ASSISTED BASICS SKILLS
INSTRUCTION GOOD FOR BLACK, DISADVANTAGED
COMMUNITY COLLEGE STUDENTS FROM WATTS
AND SIMILAR COMMUNITIES?

I. The Students of Los Angeles Southwest College

A 1979 survey of students gave this description:

On Ethnicity

92 % were Black

3 % were Asian

1.6% were Hispanic

On Income

The personal income of 54% of the students was less than \$4,000.

The personal income of 45% of the students was less than \$3,000.

The family income of 52% of the families was less than \$9,000.

The U.S. Department of Labor designated the community within a five mile radius of Southwest College as being economically depressed. According to the Department's figures, the median income of the community was between \$5,000 and \$12,499.

In addition to showing that the students are mostly black and poor, the 1979 survey also showed:

That the average student age was 26

That most students, 67%, are women

That most students, 59%, are single

That the majority of the students did not complete high school

A further descriptive statistic, one that comes from placement testing of entering students, shows that the average reading and mathematics level of freshmen is the seventh grade.

In summary, the students are black, with low income and low academic achievement.

II. The Need For Special Help

The majority of the students who enter Los Angeles Southwest College do not have the basic reading, writing, and mathematical skills necessary for them to be successful in either an academic or vocational program. The readability level of textbooks used at Los Angeles Southwest College range from a tenth to a fourteenth grade equivalent level. As mentioned earlier, the average reading level of entering students is the seventh grade level. Not only that, but indications are that it is dropping more every year. Many students read at the third and fourth grade levels. (Grant, p. 23) A concerted effort by faculty and administrators is necessary to help the disadvantaged students raise their level of proficiency in the basic skills necessary for completion of a college program.

III. The Computer-Assisted Instructional Program

In an effort to "...build competency in students" Los Angeles Southwest College has sought and obtained special funding with which to buy a computer assisted instructional program. (Grant, p.20) The grant funding requested amounts to more than \$500,000 to be received by Los Angeles Southwest and Los Angeles Trade-Technical Colleges over a three year period. The hardware to be used is control data's "micro-processor," or micro-computer. The software is the "Plato System's Basic Skills Learning System (BSLS)." At a cost of about \$8,000 each, six micro-computers were to be obtained for, and located at, Los Angeles Southwest College.

The hopes for the C.A.I. program were summarized in the grant application as follows:

It is hoped that the PLATO system's Basic Skills Learning System (BSLS) will, by upgrading students quickly, add not only to their skills but to their confidence, thus motivating them to continue and complete their academic/vocational preparation. This will lower the dropout rate from the college and produce more students capable of entering four-year colleges and/or businesses in which they can compete successfully with their increased skills.

IV. A Budget-Crunch Question

It is well known that education is a "labor intensive" industry. Typically, more than seventy-five percent (75%) of a college's annual operating expense budget goes for salaries for people. This contrasts sharply with other fields. American agriculture and American automobile production are both intensely mechanized.

While it is true that it is costly, year after year, to pay a person to stand in front of a classroom to teach the same subject, it is also true that the micro-computers that are the hardware portion of this basic skills program are also expensive. Fundamental questions arise. "Which method is cheaper?" "Which method results in greater student learning?" In short, which method is more "cost-beneficial?"

One could speculate wildly as follows:

Let us first oversimplify the "cost-benefit" question. Let us assume that an administrator at the college were planning to use the results of this study as a basis on which to decide whether to use a teacher or a micro-computer to tutor-teach DC 20 students for at least two hours per week outside the class. This oversimplification pits the flesh-and-blood teacher against the micro-computer.

If this were the case, here is one way in which the cost side of the question might be reasoned. Let us assume a full-time faculty member could teach ten, two-unit extra classes of thirty students each semester. This may not be exactly accurate - many community college faculty have a workload of fifteen units per week - but this assumption facilitates the calculations. Let us also assume that a full-time faculty member's annual salary is \$25,000. Let's see how the cost comparison might develop.

It is hoped that the eight micro-computers will, each semester, assist 300 students who are also enrolled in the faculty taught, regular, "developmental communications 20" (DC 20) class. At an average of 30 students per possible "additional" class, this number of C.A.I. students translates into ten (10) possible "additional classes," which an actual teacher might have been employed to tutor-teach.

So, during one semester, the eight micro-computers could teach 300 students or one faculty member could teach them. If the faculty member "costs" \$25,000 each year, how much does the micro-computer "cost?"

Each of the micro-computers costs about \$8,000 to purchase. Since six are needed to teach 300 students, the "up-front" cost of the six is about \$48,000. This cost occurs at the beginning of the computer-assisted Plato program. Initially then, in the short run, the computers cost more; \$48,000 the first year as compared to only \$25,000 for the "additional" faculty member for the first year. Let us assume that the micro-computers will last five years. The IRS allows businesses to depreciate computers over a five year period so there is some logic to using five years. What is the cost comparison between the teacher and the six micro-computers over five years? A rough estimate is shown below in Table 1.

Table 1 COST COMPARISON ESTIMATE FACULTY VERSUS MICRO-COMPUTER						
ALTERNATIVE	YEAR					
	1	2	3	4	5	TOTAL
TEACHER	\$25,000	\$25,000	\$25,000	\$25,000	\$25,000	\$125,000
SIX MICRO COMPUTERS	\$48,000	-0-	-0-	-0-	-0-	\$ 48,000

As the Table shows, after the second year the costs are approximately equal. After that it costs considerably more to use a teacher; so much so, that after five years, the teacher has cost \$77,000 more than the six micro-computers. Moreover, it should be noted that the estimate of \$125,000 for the teacher is low since the estimate did not provide for a cost-of-living raise each year. If the teacher were to receive only a 7% raise each year, his costs would increase as follows: Year 1 - \$25,000; Year 2 - \$26,750; Year 3 - \$28,622; Year 4 - \$30,625; Year 5 - \$32,769. With this change the total cost for the teacher is \$143,766 - almost \$100,000 more than the cost of the micro-computers.

Of course this reasoning is extremely oversimplified. There is more cost associated with the micro-computer system than just the up-front purchase price and, insofar as the auditor is aware, there is no plan to hire a teacher to help DC 20 students for two hours outside class each week. In fact, another alternative might be to hire second year college students who are good in math to act as peer tutors.

In any event, while the micro-computers at Los Angeles Southwest College are unlikely to replace either a "new" teacher, i.e., one that has not yet been hired, or an "old" one, many observers expect that education will, in the future, employ more and more such equipment. Perhaps a good balance will exist in the schools and colleges of the future, with the teachers teaching new ideas and the computers helping students with their drill and practice exercises.

V. Los Angeles County's Educational Program Audit Service

The Office of the Superintendent of Schools of Los Angeles County has for about the last nine years provided free-of-charge to local school and college districts a service appropriately referred to as an educational program audit. The audit is defined as an outside, third-party verification of the procedures and results that arise as a part of and are reported in an internal evaluation report.

In this case, the County Office has agreed to provide an audit of Los Angeles Southwest College's own evaluation of its C.A.I. Plato Basics Skills Program. In other words, the auditor of record, the present writer, will review the evaluation procedures and results and issue an audit report.

VI. Mini Audit Report:

Based upon a review of the fall semester 1981-82 evaluation procedures and results of which the auditor has been notified in a short memo dated February 4, 1982, the auditor makes the following initial, mini audit report. This report is centered mainly on two research questions which are listed on page 34 of the grant application. These questions are:

1. Will students using the PLATO system make greater gains in English over the term of the experiment than the control group (the others not in the project), as measured on pre- and post-test administrations of the Scholastic Aptitude Test (SCAT) and the Adult Basic Learning Examination (ABLE)?
2. Will students using the PLATO system have lower termination rates than the control group?

In her February 4, 1982, memo, the on-site college evaluator reported the following: Six DC 20 classes were involved in the fall semester study. Students in four DC 20 classes supplemented classroom instruction with at least two hours weekly use of the PLATO system of computer-assisted instruction. These students were in the experimental group. The students in the remaining two DC 20 classes did not supplement their classroom instruction with the PLATO computer-assisted program. The test used to determine the improvement, if any, of the PLATO system was the Nelson Reading Test which was given pre and post. The on-site evaluation report summarized the results of the DC 20 and C.A.I. versus DC 20 only experiment as follows:

The average improvement in reading levels of all experimental groups was 1.6 years and .6 for control groups. This difference of 1.0 year's reading improvement of the experimental groups is significant at the .05 level of significance.

The analyses that were performed for the auditor by his supporting statistician were different from those which the evaluator at the college employed. The audit effort used analysis of covariance on the raw scores. In addition, the audit effort "data-snooped" in an effort to investigate the possibility that the experimental group suffered a higher drop-out rate. In short, as the audit analyses indicated, there was a statistically significant difference in final reading scores - a difference that favored the experimental group. However, data-snooping uncovered the additional fact that the experimental group suffered a significantly higher attrition rate.

Why did the audit analyses include the analysis of covariance? Because, as Table 2 shows, there was not only an apparent difference in pre-test mean raw scores, but also, and more importantly, statistically, there was a "trend" in the data that suggested the pre-test means were "inclined" to be slightly different. ($P \leq .11$)

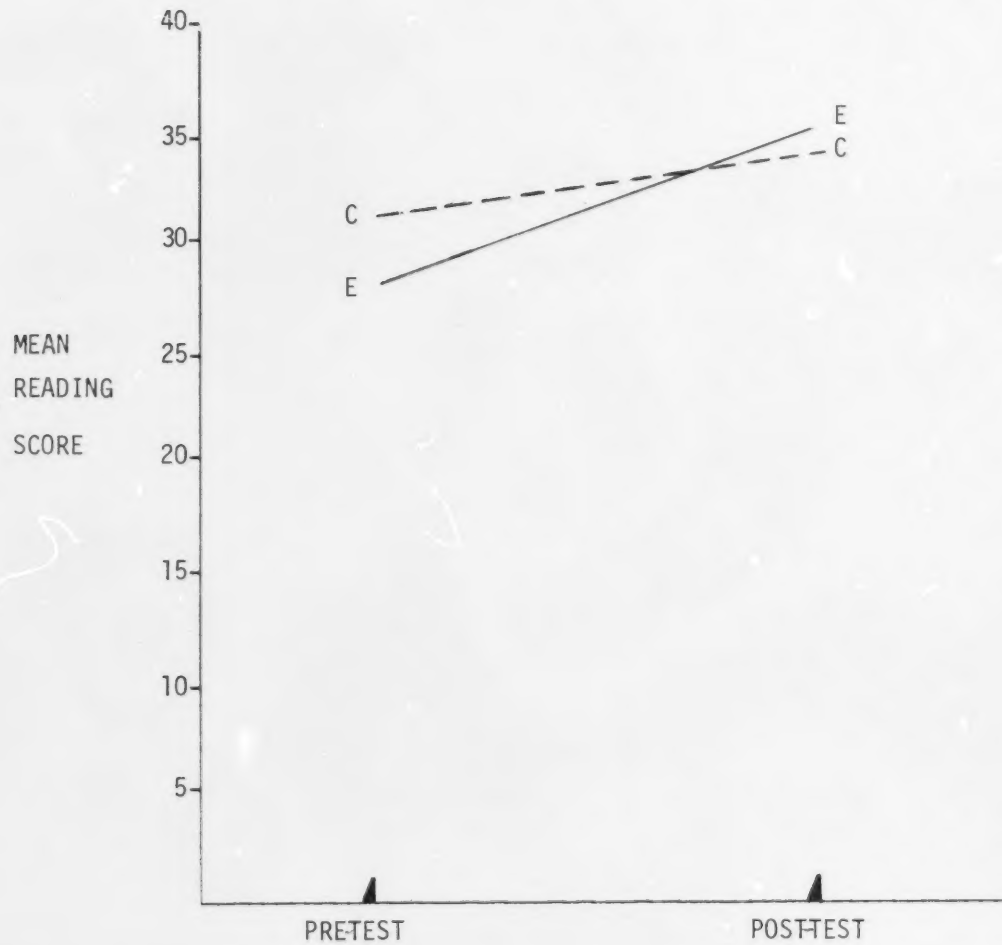
Table 2		
EXPERIMENTAL AND CONTROL GROUP RAW SCORE MEANS LOS ANGELES SOUTHWEST COLLEGE'S CAI PROGRAM (Nelson Reading Test, Fall Semester, 1981-82)		
	<u>Reading Pre-Test</u>	<u>Reading Post-Test</u>
Experimental Group Mean (n = 55)	28.0	35.4
Control Group Mean (n = 35)	31.3	34.4
- t value -	- 1.63	0.48
(Comparing Experimental and Control Group Means)		
Significance of t ($P \leq$)	0.11	0.63

A graph of the pre and post-test means is shown in Display 1.

DISPLAY 1

"APPARENT" CHANGE IN PRE AND POST-TEST RAW SCORE MEANS
LOS ANGELES SOUTHWEST COLLEGE'S CAI PROGRAM

(Nelson Reading Test, Fall Semester, 1981-82)



While the graphic display just presented suggests there was a large or dramatic change between pre and post-test means, it should be pointed out that the t tests shown in Table 2 indicated only a slight statistical "trend" toward a difference on the pre-test ($P \leq .11$) and no difference on the post-test ($P \leq .63$).

Suffice it to say that the auditor and the auditing statistician decided that the "trend" toward an inequality in pre-test means ($P \leq .11$) was enough to require that the data be analyzed by the analysis of covariance. The results of this analysis are shown below in Table 3.

Table 3					
ANALYSIS OF COVARIANCE					
DO POST-TEST SCORES DIFFER WHEN PRE-TEST SCORES ARE CONTROLLED?					
LOS ANGELES SOUTHWEST COLLEGE'S CAI PROGRAM					
(Nelson Reading Test, Fall Semester 1981-82)					
SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	3921.289	1	3921.289	65.485	0.
PRE-TEST	3921.289	1	3921.289	65.485	0.
MAIN EFFECTS	253.077	1	253.077	4.226	0.043
GROUP	253.077	1	253.077	4.226	0.043
EXPLAINED	4174.366	2	2087.183	34.856	0.
RESIDUAL	5209.590	87	59.880		
TOTAL	9383.955	89	105.438		

Do post-test scores for the experimental and control groups differ when the pre-test scores are statistically controlled? The answer, of course, is "Yes." ($P \leq .043$)

The auditor, therefore, agrees with the evaluator that on the Nelson Reading Post-Test there is a significant difference between the experimental and control groups; and that the difference favors the experimental, "PLATO-C.A.I. Supplement" group.

This result is not unambiguous, however. The data snooping uncovered a disturbing fact about the experimental group.

In roughly massaging the data, the auditing statistician noticed that higher attrition rates appeared to be associated with higher pre to post-test gain scores. The numbers have been extremely rounded, but this appearance of association is clear from Table 4 below.

Table 4 APPARENT ASSOCIATION OF GREATER GAINS AND HIGHER DROP-OUT RATES LOS ANGELES SOUTHWEST COLLEGE'S CAI PROGRAM (Nelson Reading Test, Fall Semester 1981-82)			
Faculty Code	Gain in Mean Class Score From Pretest to Posttest	Drop-out Rate	Group
A	12	78%	Experimental
B	8	61%	Experimental
C	6	53%	Experimental
D	6	50%	Experimental
E	4	52%	Control
F	2	38%	Control

Upon seeing the data in Table 4, the auditor suggested doing a Z test to test whether there was, in fact, a significant difference between the attrition rates of the experimental and control groups. The results of that test are shown below in Table 5.

Table 5 STATISTICAL COMPARISON OF ATTRITION RATES LOS ANGELES SOUTHWEST COLLEGE'S CAI PROGRAM (Fall Semester, 1981-82)			
Group	Number Enrolled	Number Who Finished	Proportion of Drops
Experimental	138	55	.60
Control	66	35	.47
$Z = 1.749$ $P \leq .05$			

At this point, the auditor has arrived at these two conclusions:

- 1) The Fall Semester experimental group outperformed ($P \leq .05$) the control group on the Nelson Reading Test. (The auditor agrees with the College's evaluator.)
- 2) The Fall Semester experimental group suffered a higher attrition rate ($P \leq .05$) than did the control group.

The first result is in line with program expectation. The second result is exactly the opposite from what was expected. Program personnel expected the experimental group would have a lower attrition rate than the control group.

Unfortunately for the micro-plato program supporters, the second result casts a "rival hypothesis" shadow on the first result. Perhaps students need to be extremely motivated to spend at least two hours a week outside class on the Plato micro-computer system. If so, only the extremely motivated students stay with it; the majority drop-out. Hence, those students who are still in the experimental group at the end of term are different from the control group students, at least in terms of their motivation levels. The post-test reading scores of the highly motivated, experimental group students might also differ from those of the control group. Although this explanation must remain a mere suspicion, one test performed by the auditing statistician adds to the suspicion.

A final analysis of covariance was performed. This time, unlike what was done for the analysis given in Table 3, dropouts in both groups were included in the analysis by arbitrarily assigning them post-test scores the same as their pre-test scores. The result was that the statistical difference between the groups disappeared. This is shown in Table 6 below.

Table 6 ANALYSIS OF COVARIANCE DO POST-TEST SCORES DIFFER IF DROPOUTS FROM BOTH GROUPS ARE GIVEN POST-TEST SCORES EQUAL TO THEIR PRE-TEST SCORES? LOS ANGELES SOUTHWEST COLLEGE'S CAI PROGRAM (Nelson Reading Test, Fall Semester 1981-82)					
SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
COVARIATES	22223.465	1	22223.465	590.485	0.
PRE-TEST	22223.465	1	22223.465	590.485	0.
MAIN EFFECTS	65.410	1	65.410	1.738	0.189
GROUP	65.410	1	65.410	1.738	0.189
EXPLAINED	22288.875	2	11144.438	296.111	0.
RESIDUAL	7564.831	201	37.636		
TOTAL	29853.706	203	147.063		

VII. Recommendations

The auditor has herein reported his reactions to the brief evaluation report contained in a February memo from the evaluator. The auditor concurs with the evaluation plan that calls for more data gathering and analysis than was presented in that memo. In particular, the auditor recommends further investigation into the following questions:

- ° Is the Plato Micro-Computer Learning System more appropriate for some students than others?
- ° If so, which kind of students are helped more by the computerized system?
- ° When Plato Micro-Computer appropriate student types are identified and matched to the program, what is the cost-benefit ... to the students ... and to the college?

ERIC Clearinghouse for Junior Colleges
96 Powell Library Building
University of California
Los Angeles, California 90024

AUG 27 1982